

# PATENT COOPERATION TREATY

## PCT

### INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

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Applicant's or agent's file reference 63032A	<b>FOR FURTHER ACTION</b> See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)	
International application No. PCT/US2004/023265	International filing date (day/month/year) 19.07.2004	Priority date (day/month/year) 12.09.2003
International Patent Classification (IPC) or both national classification and IPC C08G73/02		
Applicant DOW GLOBAL TECHNOLOGIES INC. et al		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.
2. This REPORT consists of a total of 6 sheets, including this cover sheet.
  - ☒ This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

These annexes consist of a total of 5 sheets.

3. This report contains indications relating to the following items:

- I ☒ Basis of the opinion
- II ☐ Priority
- III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- IV ☐ Lack of unity of invention
- V ☒ Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- VI ☐ Certain documents cited
- VII ☐ Certain defects in the international application
- VIII ☐ Certain observations on the international application

Date of submission of the demand  11.04.2005	Date of completion of this report  02.02.2006
Name and mailing address of the international preliminary examining authority:   European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465	Authorized Officer  Müller, M  Telephone No. +49 89 2399-8665  

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**INTERNATIONAL PRELIMINARY  
EXAMINATION REPORT**

International application No. PCT/US2004/023265

**I. Basis of the report**

1. With regard to the **elements** of the international application (*Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17)*):

**Description, Pages**

1-16 as originally filed

**Claims, Numbers**

1(part), 5(part), 6-16 filed with the demand  
1(part), 2-4, 5(part) received on 30.09.2005 with letter of 28.09.2005

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language: , which is:

- ☐ the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).  
☐ the language of publication of the international application (under Rule 48.3(b)).  
☐ the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

- ☐ contained in the international application in written form.  
☐ filed together with the international application in computer readable form.  
☐ furnished subsequently to this Authority in written form.  
☐ furnished subsequently to this Authority in computer readable form.  
☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.  
☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. The amendments have resulted in the cancellation of:

- ☐ the description, pages:  
☐ the claims, Nos.:  
☐ the drawings, sheets:

5. ☒ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)).

*(Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)*

**see separate sheet**

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6. Additional observations, if necessary:

**V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability  
citations and explanations supporting such statement**

1. Statement

Novelty (N)	Yes: Claims	
	No: Claims	1-16
Inventive step (IS)	Yes: Claims	
	No: Claims	1-16
Industrial applicability (IA)	Yes: Claims	1-16
	No: Claims	

2. Citations and explanations

**see separate sheet**

**INTERNATIONAL PRELIMINARY  
EXAMINATION REPORT - SEPARATE SHEET**

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**re item I**

The applicant has amended claim 5. Details about amendments have not been given. For this reason alone, the amendment cannot be taken into account.

Upon examination of new and original claim 5, it appears that "a difunctional amine or mixtures thereof" in the original claim has been amended to "at least two different difunctional amines" in new claim 5. While the original wording embraces the possibility of more than one difunctional amine, the specific number of two different difunctional amines is not disclosed in the original claim. The original claim hence cannot serve as a basis for the new claim. The examples as originally filed disclose a mixture of two specific amines. Any disclosure of two amines in general is not derivable from the examples. Hence, the examples cannot form a basis for new claim 5 either.

The amendment of claim 5 thus is not supported by the application as filed. Said amendment therefore cannot be taken into account when drafting the international preliminary examination report.

**re item V**

**Cited documents**

D1: US-A-6569983

D2: US-A-5464924

D3: US-A-4396499

D4: WO-A-03053536

D5: US-A-6315908

**Novelty (Article 33(2) PCT)**

D2 (example 1) discloses the reaction of

- (i) 8.16 mmol Jeffamine M600, which is a primary amine with an ethoxy-propoxyalkylene substituent (column 4, lines 25 - 40),
- (ii) the diglycidylether of bisphenol A and
- (iii) 32.63 mmol 2-aminoethanol.

The resulting product is identical to the claimed one with A being  $N(CH_2)_2OH$ ,  $R^1$  being bisphenol-A, R being hydrogen and B being  $N-CHCH_3-CH_2-(O-CHCH_3-CH_2)_q-OCH_3$  with q being less than 40 (follows from the fact that the Jeffamine has a molecular weight of 600,

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see column 9, line 23) and x being between 0.2 and 0.8 (follows from the molar amounts of the Jeffamine and aminoethanol applied in the example as well as from claim 1 of D2). Consequently, the subject-matter of at least claims 1 - 16 lacks novelty over D2.

D3 (column 2, lines 43 - 50) discloses polymers prepared from

- (i) Jeffamine D230 or ED-600, i.e. a primary amine with an ethoxy-propoxy-substituent and
- (ii) the diglycidylether of bisphenol A.

D3 thus is novelty-destroying for at least the subject-matter of claim 5. It is noted in this respect that the applicant's argument that D3 uses diamines instead of the monoamines of the present application is not correct. Reference is made to independent process claim 5 of the present application which explicitly starts from **difunctional** amines.

D4 (page 8, lines 21 - 22 and example 30) discloses the reaction product of

- (i) Jeffamine XTJ-505, which is a monoamine terminated polyethylene/polypropylene glycol and
- (ii) the diglycidylether of, e.g. 1,3,5-triglycidyl benzene.

The reaction product is a polyhydroxyetheramine with aromatic ether units. Hence, at least the subject-matter of claim 5 lacks novelty over D4.

The argument that the subject-matter of claim 5 differs from the disclosure of D4 as D4 does not disclose a diglycidyl ether of bisphenol is not correct as at least alternative (3) of claim 5 is not restricted to any bisphenol A diglycidyl ether.

D5 (column 2, line 14 to column 3, line 9) discloses the reaction product of

- (i) Jeffamine M-2070, the amine applied in several examples of the present application and
- (ii) a multifunctional aromatic epoxide.

Hence, at least the subject-matter of claim 5 lacks novelty over D5. It is noted in this respect that claim 5 does not require any monofunctional amine to be applied. It is further noted that the amendment effected in claim 5 cannot introduce any distinguishing feature into this claim as it extends beyond the content of the application as originally filed.

D1 discloses water-soluble branched polyhydroxyetheramines (column 1, lines 7 - 10). The branched polyhydroxyetheramines are prepared by reacting an amine having two reactive

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hydrogen atoms with a diepoxide. The amine is exemplified as a primary amine with an oxyethylene-oxypropylene substituent (amine (b) in column 4, line 65). Consequently, the branches consist of polyoxyalkylenes. Further alkylene oxide branches can be introduced by halogen containing polyalkoxide (column 6, lines 62 - 63). The diepoxides disclosed in D1 are exclusively aliphatic.

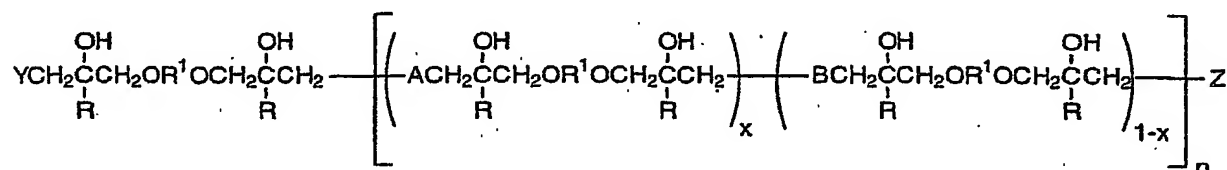
Consequently, the subject-matter of all claims 1 - 16 differs from the disclosure of D1 in that the ether moiety (resulting from the diepoxide) is aromatic (R<sup>1</sup> is an aromatic moiety). Novelty over D1 thus can be acknowledged.

**Inventive step (Article 33(3) PCT)**

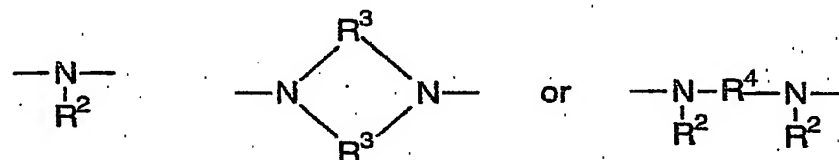
It is not clear which problem is solved by the subject-matter of claims 1 - 17 over the cited documents. Hence, the subject-matter of all claims lacks inventive step over these documents.

WHAT IS CLAIMED IS:

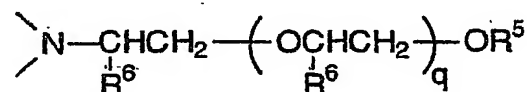
1. A water-soluble polymer comprising a  
 copolyhydroxyaminoether having side-chains of polyalkylene  
 5 oxides; wherein the water soluble polymer is represented  
 by the formula:



wherein R is hydrogen or C<sub>1</sub>-C<sub>20</sub> alkyl; R<sup>1</sup> is  
 individually an aromatic or substituted aromatic moiety; Y  
 10 is an organic moiety that does not contain an epoxy group  
 and Z is an organic moiety, optionally containing an epoxy  
 group; x is 0-0.99; and n is 5-400; each A is individually  
 an amino group represented by one of the formulas:



15 wherein R<sup>2</sup> is hydrocarbyl or substituted  
 hydrocarbyl; R<sup>3</sup> is C<sub>2</sub>-C<sub>10</sub> hydrocarbylene or substituted  
 hydrocarbylene; R<sup>4</sup> is C<sub>2</sub>-C<sub>20</sub> hydrocarbylene or substituted  
 hydrocarbylene, wherein the substituent(s) is hydroxyl,  
 cyano, halo, arlyloxy, alkylamido, arylamido,  
 20 alkylcarbonyl, or arylcarbonyl; and each B is represented  
 by the formula:



wherein R<sup>5</sup> is hydrocarbyl; each R<sup>6</sup> is individually  
 hydrogen, methyl, ethyl, hydrocarbyl or combinations

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thereof; and  $x$  is 0-0.99 when  $q$  is greater than 40 but less than 0.2 or greater than 0.8 when  $q$  is less than 40.

2. The polymer of Claim 1 wherein  $R$  is hydrogen; each  $R^1$  is individually isopropylidenediphenylene, 1,4-phenylene, 1,3-phenylene, methylenediphenylene, thiodiphenylene, carbonyldiphenylene, or combinations thereof; each  $R^2$  is individually methyl, ethyl, phenyl, benzyl, 2-hydroxyethyl, 3-hydroxypropyl, 2-hydroxypropyl, 2,3-dihydroxypropyl, 2-(acetamido)ethyl, or combinations thereof;  $R^3$  and  $R^4$  are individually (change made for consistency) ethylene, 1,2-propylene, 1,2-butylene, or combinations thereof; and  $R^5$  is  $C_1$ - $C_{20}$  alkyl;  $R^6$  is a mixture of hydrogen and methyl; each of  $Y$  and  $Z$  are individually bis(2-hydroxyethyl)amino or  $N$ -(2-hydroxyethyl)piperazinyl;  $q$  is 20 - 50, and  $n$  is 10 - 25.

3. The polymer of Claim 2 wherein  $R^1$  is isopropylidenediphenylene and  $R^2$  is 2-hydroxyethyl.

4. The polymer of Claim 2 wherein each  $R^5$  is individually hydrogen, methyl, ethyl, propyl, butyl, benzyl or combinations thereof;  $Y$  and  $Z$  are bis(2-hydroxyethyl)amino.

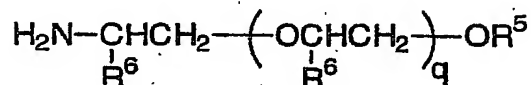
5. A process for preparing a water-soluble polymer which comprises (1) reacting an equivalent or excess of at least two different difunctional amines with an excess or equivalent amount of a diglycidyl ether of a bisphenol or mixtures thereof, optionally in the presence of a monofunctional nucleophile and optionally in the presence of a catalyst and/or a solvent; or (2) reacting an equivalent or excess of at least two different difunctional amines



thereof with an excess or equivalent amount of a diglycidyl ether of a bisphenol or mixtures thereof, optionally in the presence of a monofunctional nucleophile which functions as a terminating agent and, optionally, in the presence of a catalyst and/or a solvent; or (3) dissolving in an organic or non-organic solvent an amine selected from the group consisting of primary amine, a bis(secondary) diamine, or a mono-amine-functionalized poly(alkylene oxide) or mixtures thereof, adding to the amine solution a diglycidyl ether in an amine hydrogen equivalent to epoxide equivalent ratio of from 0.9:1 to 1.2:1 under conditions sufficient to cause the amine moieties to react with the epoxy moieties to form a polymer backbone having amine linkages, ether linkages and pendant hydroxyl moieties.

6. The process of Claim 5 wherein the non-organic solvent is water and the monofunctional nucleophile is selected from the group consisting of a secondary amine, hydrogen sulfide, ammonia, ammonium hydroxide, a monofunctional phenol, an aryloxy salt, a carboxylic acid, a carboxylic acid salt, a mercaptan, and thiolate salt.

7. The process of Claim 5 wherein the difunctional amine is ethanolamine or a primary amine having the formula:



wherein  $\text{R}^5$ ,  $\text{R}^6$  and  $q$  are as defined above; the diglycidyl ether of a bisphenol is the diglycidyl ether of bisphenol A.

8. The process of Claim 5 wherein the monofunctional nucleophile is selected from the group consisting of diethanolamine, N-(2-hydroxyethyl)piperazine, piperadine, diethylamine, dipropylamine, and dibenzylamine.

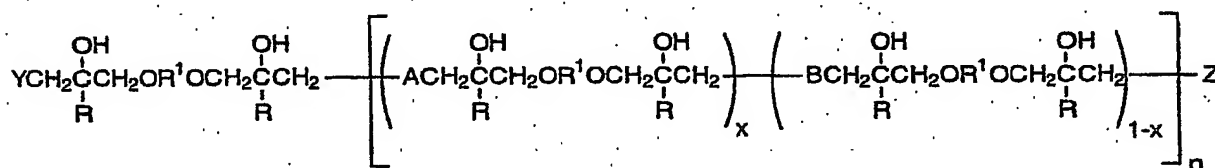
9. The process of Claim 5 wherein the monofunctional nucleophile is selected from the group consisting of phenol, acetic acid and propanoic acid and the catalyst is selected from the group consisting of a phosphonium or ammonium salt.

10. The process of Claim 5 wherein the solvent is selected from the group consisting of 1-methyl-2-pyrrolidone, N,N-dimethylacetamide, water, diglyme, triglyme, diethylene glycol ethyl ether, diethylene glycol methyl ether, or propylene glycol methyl ether.

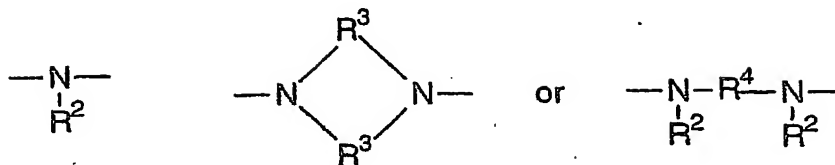
11. A water-soluble polymer prepared by the process of Claim 5.

12. A composition comprising an aqueous fluid and the water-soluble polymer of Claim 1.

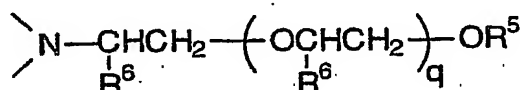
13. An aqueous solution comprising a polymer represented by the formula:



wherein each R is individually hydrogen or C<sub>1</sub>-C<sub>20</sub> alkyl; R<sup>1</sup> is an aromatic or substituted aromatic moiety; Y is an organic moiety that does not contain an epoxy group and Z is an organic moiety, optionally containing an epoxy group; x is 0-0.99; and n is 5-400; each A is individually an amino group represented by one of the formulas:



wherein R<sup>2</sup> is hydrocarbyl or substituted hydrocarbyl; R<sup>3</sup> is C<sub>2</sub>-C<sub>10</sub> hydrocarbylene or substituted hydrocarbylene; R<sup>4</sup> is C<sub>2</sub>-C<sub>20</sub> hydrocarbylene or substituted hydrocarbylene; and each B is represented by the formula:



wherein R<sup>5</sup> is hydrocarbyl; each R<sup>6</sup> is individually hydrogen, methyl, ethyl, hydrocarbyl or mixtures thereof; and x is 0-0.99 when q is greater than 40, but less than 0.2 or greater than 0.8 when q is less than 40.

14. The aqueous solution of Claim 13 wherein in the formula representing the polymer, R is hydrogen; each R<sup>1</sup> is individually isopropylidenediphenylene, 1,4-phenylene, 1,3-phenylene, methylenediphenylene, thiodiphenylene, carbonyldiphenylene, or combinations thereof; each R<sup>2</sup> is individually methyl, ethyl, phenyl, benzyl, 2-hydroxyethyl, 3-hydroxypropyl, 2-hydroxypropyl, 2,3-dihydroxypropyl, 2-(acetamido)ethyl, or combinations thereof; R<sup>3</sup> and R<sup>4</sup> are individually ethylene, 1,2-propylene, 1,2-butylene, or combinations thereof; and R<sup>5</sup> is C<sub>1</sub>-C<sub>20</sub> alkyl.

15. The aqueous solution of Claim 13 wherein viscosity increases as temperature is increased.

16. A process which comprises dissolving the polymer of Claim 1 in water, the water optionally containing acids, bases, salts, solvents, or mixtures thereof.